

ORIGINAL REPORTS

The Future of General Surgery: Evolving to Meet a Changing Practice

Eric M. Webber, MD, FRCSC,* Ashley R. Ronson, MSc,[†] Lisa J. Gorman, MA,[†]
Sarah A. Taber, MHA, MGSS,[†] and Kenneth A. Harris, MD, FRCSC[†]

*Department of Surgery, University of British Columbia Faculty of Medicine, Vancouver, British Columbia, Canada; and [†]Royal College of Physicians and Surgeons of Canada, Ottawa, Ontario, Canada

PURPOSE: Similar to other countries, the practice of General Surgery in Canada has undergone significant evolution over the past 30 years without major changes to the training model. There is growing concern that current General Surgery residency training does not provide the skills required to practice the breadth of General Surgery in all Canadian communities and practice settings.

PROCEDURE: Led by a national Task Force on the Future of General Surgery, this project aimed to develop recommendations on the optimal configuration of General Surgery training in Canada. A series of 4 evidence-based sub-studies and a national survey were launched to inform these recommendations.

MAIN FINDINGS: Generalized findings from the multiple methods of the project speak to the complexity of the current practice of General Surgery: (1) General surgeons have very different practice patterns depending on the location of practice; (2) General Surgery training offers strong preparation for overall clinical competence; (3) Subspecialized training is a new reality for today's general surgeons; and (4) Generation of the report and recommendations for the future of General Surgery. A total of 4 key recommendations were developed to optimize General Surgery for the 21st century.

CONCLUSIONS: This project demonstrated that a high variability of practice dependent on location contrasts with the principles of implementing the same objectives of training for all General Surgery graduates. The overall results of the project have prompted the Royal College to review the training requirements and consider a more "fit for purpose" training scheme, thus ensuring that General Surgery residency training programs would optimally prepare residents for a broad range of practice settings and locations across Canada. (J Surg Ed 73:496-503. © 2016

The Authors. Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

KEY WORDS: general surgery, residency training, internship, surgical practice

COMPETENCIES: Patient Care, Medical Knowledge, Systems-Based Practice

INTRODUCTION

Defining the practice profile and training for General Surgery is both inherently challenging and fundamentally important to ensure that it remains relevant, as it is for other generalist specialties. Newer specialties and subspecialties are created based on narrower anatomic regions and the application of specific technologies. By their nature, these specialties and subspecialties tend to be consolidated in academic centers and larger urban regions where most teaching and training occurs. The generalist specialty must adapt to the resulting changes in practice, which often lead to a narrower focus for the generalist specialty in larger centers, whereas maintaining a broader range of competencies in smaller and more remote centers. Under the leadership of the Royal College of Physicians and Surgeons of Canada (Royal College), General Surgery has undergone an important re-examination to evaluate practice and training in this second decade of the 21st century.

The Royal College is responsible for setting standards and requirements for training and recognizing all specialties and subspecialties in Canada, with the exception of Family Medicine, which is overseen by a separate college. As such, the Royal College accredits residency training programs and certifies specialists and subspecialists on completion of their training in Canada. At its inception in 1929 the Royal College recognized 2 specialties: Medicine and Surgery.

Correspondence: Inquiries to Kenneth A. Harris, MD, FRCSC, Royal College of Physicians and Surgeons of Canada, Ottawa, Ontario, Canada; fax: +1 613 730 3707; e-mail: kharris@royalcollege.ca

With the advent of new specialties, what was initially called “Surgery” eventually became “General Surgery,” and since that time the Royal College has been both a witness and a participant in the evolution of this specialty. Surgery has undergone numerous changes such that there are now 10 primary surgical specialties¹ and 8 surgical subspecialties.² In Canada, unlike some other countries, General Surgery is a stand-alone specialty and not a foundational element for all surgical specialties. Not only have new disciplines formed in the past century, but the practice of surgery, in particular General Surgery, has also changed (e.g., introduction of new procedures and technological advancements).

The current configuration of General Surgery residency training dates back many years to an earlier era of medical and surgical practice. Since that time, the discipline has seen significant evolution because of the development of other surgical specialties, growing subspecialization, technological changes, fiscal restraint, and demographic changes in the Canadian population¹—changes that have included a trend to focus practice in larger communities and a desire to maintain breadth within advancing technologies in smaller centers. Many of these changes have significantly impacted surgical knowledge, contributed to different divisions of labor among both surgical and nonsurgical disciplines and, consequently, have led to changes in the delivery of surgical care.² Although such changes have certainly exerted influence on many disciplines, these changes are perhaps most notable within General Surgery given its heritage and because of its sheer breadth and less clearly defined boundaries.

New surgical specialties and subspecialties have arisen and matured over the course of the 20th and 21st century, based largely on their focus on specific organ systems or anatomic regions. As such these newer surgical disciplines and their scopes of practice were relatively easy to describe. However, their separations made General Surgery increasingly nebulous and difficult to define. This is compounded by the fact that the scope of General Surgery varies significantly between larger centers—where many of these other surgical specialists and subspecialists practice—and smaller centers—where many aspects of surgical care default to General Surgery and general surgeons continue to have much broader practices.

In Canada, medical school graduates enter residency training directly into 1 of the 10 primary surgical specialties, each of which is 5–6 years in duration. General Surgery is a 5-year residency program. Residents training in Canada must fulfill the Specialty Training Requirements in General Surgery to be certified by the Royal College in General Surgery. According to

the most recent definition of a general surgeon in the current training standards documents, “The general surgeon is an eclectic surgical specialist whose practice deals mainly with the alimentary tract, trauma and critical care, endocrine and breast diseases, cancer surgery, and endoscopy. By virtue of training, special interest or circumstance, the practice of General Surgery may be narrowly focused or may extend to diseases or injuries affecting virtually any system of the body... ”³ Further, these training standards documents highlight the skills required of general surgeons, rather than the procedures for which general surgeons must demonstrate competence.

Following completion of specialty training in General Surgery, practitioners have the option of completing additional subspecialty training in one of the 4 recognized subspecialties, that include Colorectal Surgery, General Surgical Oncology, Pediatric Surgery, and Thoracic Surgery or to enter surgical practice directly. In addition, less formalized training is available in other clinical domains such as minimally invasive surgery, trauma surgery³, transplant surgery, and hepatobiliary surgery through postresidency fellowships.

Social accountability and the expectations of provincial ministries of health dictate that Canada’s residency programs need to train general surgeons who can safely respond to the needs of a diverse collection of communities. However, without parallel evolution in training programs, concerns have emerged that current General Surgery residency training may not provide graduates with the skills required to practice the discipline in the variety of Canadian communities and practice settings in which general surgeons work. This may have the unintended consequence of driving the need for further fellowship training geared to maintain breadth of practice.

Many Canadian stakeholders agreed that the current model of residency training must be fundamentally re-examined² to match practice. Beyond this, and perhaps in recognition that the factors exerting influence upon General Surgery are not context-specific, we have increasingly observed that our international colleagues are also addressing similar challenges. One of the earliest efforts to address these concerns is reflected within the American Surgical Association’s Blue Ribbon Committee on surgical training, who issued a series of recommendations regarding surgical transformation in light of similar pressures, both demographic and technological.⁴ A landmark study conducted in the United States 5 years later, a jurisdiction with arguably similar residency training in General Surgery, also highlights “important problems” for educators related to the adequacy of General Surgery training.⁵ This study concluded that there was not only a gap between the expectations of program directors of General Surgery and the education obtained by residents in those programs, as measured by the

¹ Royal College primary surgical specialties include Cardiac Surgery, General Surgery, Neurosurgery, Obstetrics and Gynecology, Ophthalmology, Orthopedic Surgery, Otolaryngology—Head and Neck Surgery, Plastic Surgery, Urology, and Vascular Surgery.

² Royal College surgical subspecialties include Colorectal Surgery, Critical Care Medicine, General Surgical Oncology, Gynecologic Oncology, Gynecologic Reproductive Endocrinology and Infertility, Maternal-Fetal Medicine, Pediatric Surgery, and Thoracic Surgery.

³ Trauma Surgery is available as an Area of Focused Competence—Diploma program (AFC-Diploma). AFC-Diploma programs typically represent either a) supplemental competencies that enhance the practice of physicians in an existing discipline or b) a highly specific and narrow scope of practice that does not meet the criteria of a subspecialty.

number of repetitions of each specific procedure, but also that there was significant variability in General Surgery training across the country.

In recent years, Klingensmith et al. have identified challenges in the surgeon's exposure to practice management expertise—i.e., those skills that are essential to running a practice,^{5,6} as well as the importance of mentorship for trainees as a factor in the pursuit of Fellowship training.⁷ Many of these factors would be raised within this work, although the recommendations to address them are slightly different from what has been pursued in the United States, in recognition of the Canadian context for surgical care delivery, which is very much impacted by demographic factors as well as fiscal differences between our 2 countries.

To address these issues within Canada, a Task Force on the Future of General Surgery was assembled with the overarching goal of guiding Royal College Canadian General Surgery residency training programs to optimally prepare residents for the full range of practice settings and locations across Canada in which general surgeons work, and to offer specific recommendations as to how to achieve this end.

MATERIAL AND METHODS

This project was led by a national Task Force on the Future of General Surgery, which comprised leaders from a broad range of surgical disciplines and practice locations with a strong background in surgical specialization and medical education. Recognizing the importance of evidence-informed decision-making, a series of 4 sub-studies (as below) and a national survey were launched to inform the project's participants.

The project was carried out over a series of 3 phases throughout 2012 and 2013: preliminary research (phase 1), national consensus summit (phase 2), and development of recommendations (phase 3). The project involved the following key activities and research methods to come to the conclusions detailed within this article.

Interviews With Stakeholders

Informal group discussions were held between representatives of the Task Force and surgical leaders in Canada throughout the fall of 2012. Stakeholders included representatives from the Canadian Association of General Surgery, resident groups, regulatory authorities, provincial ministries of health, and national organizations.

National Survey of Certified General Surgeons

The national survey of general surgeons certified by the Royal College was developed and administered by the project secretariat in collaboration with the Task Force

and the Medical Education Research Group at the Children's Hospital of Eastern Ontario Research Institute. All active fellows certified in General Surgery by the Royal College were invited to participate in the survey. Invitations were sent to 2125 practicing general surgeons, of whom 566 completed the survey (27% response rate).

Jurisdictional Review

To further inform the development of recommendations, 6 informal semi-structured individual interviews were held with key representatives from the United States, the United Kingdom, and Australia at the International Conference on Surgical Education and Training and the International Conference on Residency Education in 2012. A literature-based search was also conducted to acquire further information on the jurisdictions in question.

Historical Analysis

We conducted an historical analysis to inform us of the reasons for current policies and practices. A sum of 2 primary sources of data were used for the historical analysis. An archives-based search of the Royal College's meeting minutes and records of decision-making pertinent to discipline recognition was undertaken to understand the chronology of changes to the recognition of surgical specialization over time. In addition, the current and historic Objectives of Training documents outlining training goals for the discipline of General Surgery (1982-current) were reviewed to identify changes in the definition and certification requirements for General Surgery, as they were articulated by the specialty committee responsible for oversight of the discipline over the past 30 years.

National Summit on the Future of General Surgery, 2013

A full-day meeting was held in Ottawa, Ontario, to discuss the future of General Surgery with a diverse group of key stakeholders and international representatives and to review research results from the other phases of the project, as noted earlier. Key objectives of the day included examining challenges facing the discipline, recommending competencies needed of general surgeons to meet societal health needs now and in the future, and developing recommendations for the future of General Surgery residency education.

We would posit that the process and methodology used to develop the key recommendations associated with this project is broadly applicable. Firstly, utilizing the same key questions and model, the methodology may be instructive to other jurisdictions who are facing the same challenges regarding the delivery of surgical services, and the training to meet those challenges. Secondly, we would also suggest

that—with a new series of key questions—the same methodology and process could be utilized for other research queries which are more broadly applicable to other challenges in our medical education systems writ large. The consultative approach utilized by this project has been instructive and is serving as a model for other projects undertaken by our team.

RESULTS AND DISCUSSION

A large and rich amount of data was gathered throughout this project on general surgeon practice patterns, efficacy of training, and formal training. The results of other components of this project would be published elsewhere. Generalized findings from the multiple methods of the project speak to the complexity of the current practice of General Surgery.

General Surgeons Have Very Different Practice Patterns Depending on the Location of Practice

One of the key findings of the historical analysis related to the heterogeneity of the discipline of General Surgery. As evidenced by definitions developed by the Specialty Committee in General Surgery, general surgeons have a broad range of practices depending on the location in which they train and practice, and the availability of other surgical and nonsurgical (sub)specialists working in these areas. Presently, all Canadian General Surgery training programs are based at universities with medical schools and traditionally much of the clinical training has been provided at relatively large urban hospitals. In this practice environment general surgeons tend to work in relatively narrow, focused areas with support of multiple subspecialists. This provides residents a significant volume of clinical activity and particular experience with complex cases, but it does not give them much exposure to the breadth of clinical work undertaken by general surgeons in smaller communities with a generalist approach.

Noted in earlier iterations of the Royal College documents for General Surgery, findings from the national survey corroborate this observation. General surgeons in different practice settings—from large urban Academic Health Science Centers (AHSCs) and suburban centers, to regional centers, to rural or remote hospitals—have distinct patterns of surgical practice. For example, significantly more general surgeons in rural or remote hospitals (53.5%) perform Caesarian Sections than general surgeons in AHSCs (3%). Likewise, all general surgeons in rural settings (100%) performed colonoscopies in the past year compared with just over half of general surgeons in AHSCs (60.8%).

The survey results and subsequent discussions suggest that there may be 2 or 3 major subgroups of practice

patterns depending on location, size of community, and size of health center. There are significant implications of such divergence in practice patterns. Variations in practice have implications not only for the content of surgical training, but may also limit accurate health human resources modeling if these differences in General Surgery practice cannot be accounted for.

General Surgery Training Offers Strong Preparation for Overall Clinical Competence

Results from the national survey highlighted that at the end of residency almost all respondents indicated that they felt prepared for practice in technical ability (93.4%) and clinical knowledge (98.3%). However, fewer general surgeons indicated feeling prepared regarding the skills needed to run a practice (24.1%).

General surgeons were also asked, how they prepared were to independently perform a list of 78 index surgical procedures—a sample intended to represent the breadth of practice—on the completion of residency training. The 78 index surgical procedures were selected from the Surgical Council on Residency Education curriculum to reflect breadth, scope, and complexity of practice. The list of procedures was iterated and validated by the project Task Force until a comprehensive but brief list of procedures was agreed upon. Almost all respondents indicated that they felt confident to independently perform at least 8 of the 10 most common procedures (i.e., procedures performed 11+ times in the past year). For 2 of the procedures (laparoscopic appendectomy and laparoscopic cholecystectomy), a minority of respondents (24% and 33%, respectively) indicated that they did not receive training in these procedures. However, the likely explanation is that these procedures were introduced after these respondents had completed their residencies (Fig. 1). Indeed, respondents who were trained and competent in each of these procedures had graduated from residency training more recently (laparoscopic appendectomy: mean graduation year of 2000 vs. 1986, t -test (429) = 15.16, $p < 0.001$; laparoscopic cholecystectomy: mean graduation year of 1999 vs. 1982, t -test (267.58) = 21.73, $p < 0.001$). Findings related to the strong preparation for clinical practice were also corroborated by early discussions with leaders in General Surgery undertaken as part of the project.

The general findings of this project highlighted a need to ensure that training is appropriately and efficiently matched to eventual practice for all general surgeons. In particular, a substantial number of general surgeons in the national survey indicated that although they had received training, they still did not feel comfortable performing specific surgical procedures independently (Table). In particular, not all respondents indicated feeling competent to perform certain procedures (without supervision) on completing residency. Such situations where competence may not be

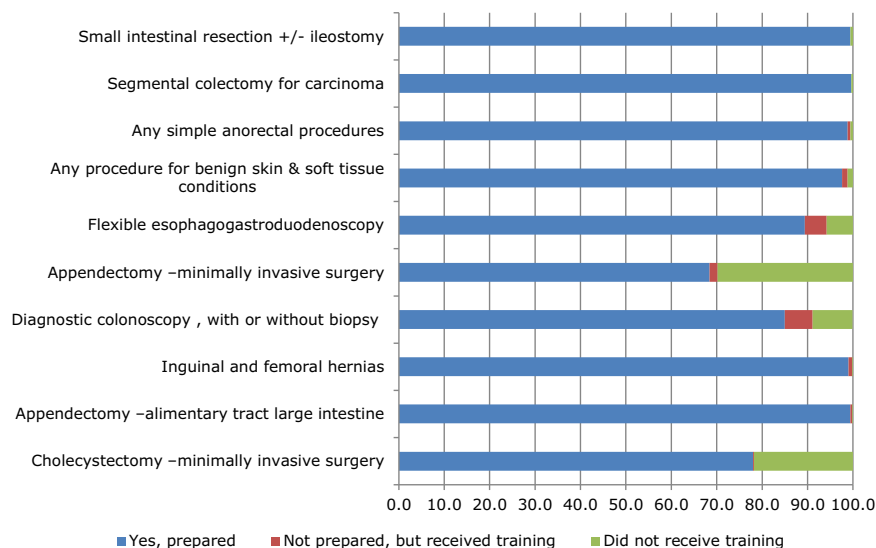


FIGURE 1. Percentage of respondents who indicated feeling prepared to perform the most commonly performed General Surgery procedures on completion of residency training.

optimal likely arise from differences between the case-mix at the hospitals where these residents trained and that in their subsequent practice.

As a result of these findings, more work may be needed to ensure that at least some of the training is linked to specific requirements of eventual practice, while maintaining national standards for the discipline.

Subspecialized Training is a New Reality for Today's General Surgeons

In the United States, the United Kingdom, and Australia, a high percentage of general surgeons undertake further training in other surgical subspecialties. In this project's national survey of Canadians, 63% of respondents indicated that they had undergone additional formal training

following completion of their General Surgery residency programs. A variety of reasons were cited by respondents, including a perception that further training was necessary for employment, the undervalued status of General Surgery training alone, and a sense that pursuing subspecialized training to focus one's practice might be a way of achieving mastery and excellence that is otherwise difficult to achieve in General Surgery. Of those who indicated having received additional training, the majority stated that this was because of personal interest in the field (Fig. 2). However, a few respondents indicated they had undergone additional training because they felt inadequately prepared or because they needed to increase their confidence. Given the nature of the survey, this may underestimate the actual number of respondents with these concerns.

Generation of the Report and Recommendations for the Future of General Surgery

The project's final report reflects the findings and implications from each of the 3 phases of the project (preliminary research, national summit, development of recommendations) and was approved by the Future of General Surgery Task Force. The report outlines a series of what appear to be reasonable, yet challenging, recommendations that are intended to transform General Surgery residency training in Canada to better prepare graduates for changing practice environments.

The project recommendations were developed through a formal process during the National Summit. National Summit attendees were organized into small working groups to discuss several key principles—value statements agreed on by the Task Force—which were ultimately used as a

TABLE. Percentage of Residents Indicating That They Were Trained in a Specific Procedure but They Did Not Feel Competent Performing That Procedure Independently on Completion of Residency Training (Top 10 Procedures Noted)

Procedure	Residents % (n)
(1) Pancreaticoduodenectomy	61.2 (314)
(2) Hepatic lobectomy	58.3 (302)
(3) Repair infrarenal aortoiliac aneurysm	54.4 (276)
(4) Segmentectomy/lobectomy	54.0 (215)
(5) Any lung resection	51.7 (258)
(6) Total esophagectomy	48.5 (251)
(7) Any complex anorectal procedures	47.9 (246)
(8) Emergency embolectomy/ thrombectomy artery	42.3 (215)
(9) Repair of esophageal perforation	41.3 (213)
(10) Adrenalectomy—open or MIS	39.1 (198)



FIGURE 2. Percentage of respondents indicating their reasons for undergoing additional training ($n = 421$).

starting point to inform and shape the development of the recommendations. Following extensive discussions and initial work at the Summit, iterations of the recommendations were further refined (during the Summit and subsequently) by the Task Force via teleconference and e-mail. The key principles underlining the recommendations of the project were

- (1)** Introducing the concept of enhanced training in General Surgery. There was strong agreement that a single specialty of General Surgery be maintained. All residents should be trained in General Surgery programs that would provide them with a shared set of foundational knowledge and skills to work throughout the country. In addition this project proposed a redesigned approach to residency education in General Surgery that could allow a portion of the program to be tailored to differing practice contexts, such as smaller communities or larger urban centers (e.g., enhanced areas of expertise). This would allow the maintenance of a national standard while allowing training to meet practice needs to be undertaken within residency training.
- (2)** The importance of foundational training to prepare trainees in all surgical specialties, including General Surgery, is a reality in many jurisdictions to ensure optimal skill development.
- (3)** Promoting the generalist ethos of General Surgery aligns with a Canadian initiative emphasizing an appropriate mix of generalists and specialists.² It is widely recognized that subspecialists as well as the multispecialty General Surgeon, who practices the broad reaches of this discipline, have valuable roles in the spectrum of care delivery.
- (4)** Ensuring equitable service delivery across the country—many stakeholders spoke of a “rural imperative” for the reassessment of surgical delivery and care. To be equitable, the design and provision of

surgical services must consider first and foremost societal health needs across the spectrum from rural and remote communities through to larger urban settings across the country.

A sum of 4 key recommendations (Fig. 3) were developed to optimize General Surgery for the 21st century. The recommendations are based on a synthesis of all of the various avenues of research conducted through this project and the national summit with General Surgery leaders. They are written to reflect the main findings of the project and speak to the potential redesign of General Surgery residency training in this country, and to strengthen the relationship between training and eventual practice. Among the suggestions raised by the Task Force, the recommendations focus on the possibility of structuring training based on a surgeon’s projected field of practice (enhanced areas of expertise⁴), implementing an increased focus on competency-based education, encouraging training programs to offer explicit transition-to-practice periods for General Surgery residents, and highlighting the importance of developing additional post-General Surgery residency training (i.e., Areas of Focused Competence diplomas and clinical fellowships) as complements to enhanced areas of expertise that are not contained in residency (e.g., Trauma General Surgery was developed as an Areas of focused competence diplomas to meet a particular societal health need and goes above and beyond typical General Surgery residency training).

⁴ An enhanced area of expertise is an approach of residency training within the primary specialty of General Surgery that is distinctly tailored to future intended practice, rather than focused on specific anatomic regions of the body. Specific enhanced areas of expertise are yet to be determined but would be based on particular practice settings (e.g., community-based General Surgery) and may include Clinician Scientist preparation among others.

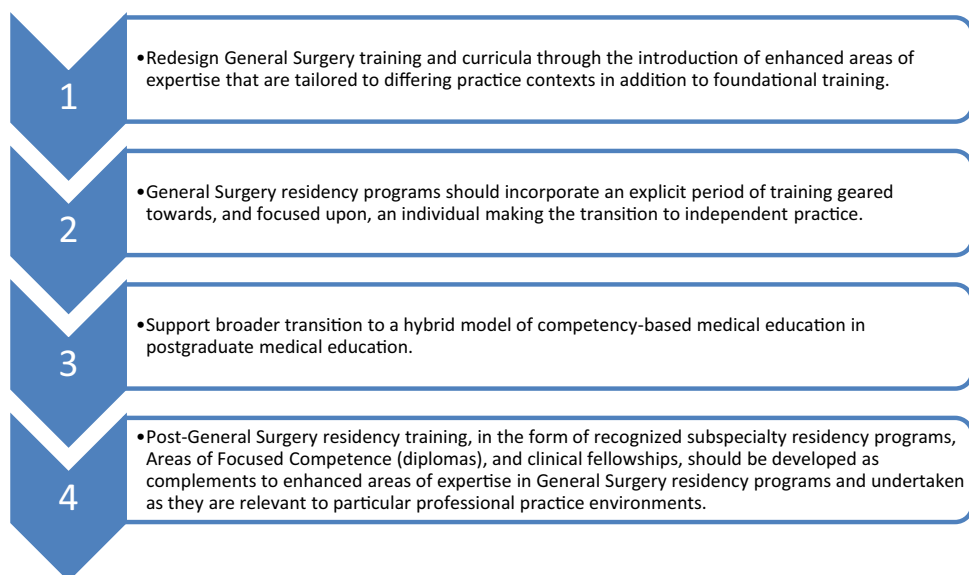


FIGURE 3. Recommendations for the future of General Surgery in Canada.

CONCLUSIONS

The Future of General Surgery Task Force achieved its objectives of contributing to national and international discourse on the topic and focusing the priorities for General Surgery residency education in Canada. This project demonstrated that the high variability of practice dependent on location challenges the principles of implementing the same objectives of training for all General Surgery graduates. It also highlighted a need to revisit training to ensure that the Royal College training programs are indeed optimally preparing residents for eventual practice in all settings across Canada.

Future directions for the discipline of General Surgery include developing Objectives of Training that facilitate the achievement of exit competencies that match skills required for independent practice. The specialty committee in General Surgery is currently considering the possibility of introducing “enhanced areas of expertise” to core training, aspects of residency training that are distinctly tailored to future intended practice.

The project’s findings further underline the rationale for introducing a competency-based medical education model by focusing on the creation of a seamless transition to practice, as well as optimizing and tailoring training to meet societal health needs. The recommendations of the project align with the Royal College’s multiyear transformational change initiative, Competence by Design. Competence by Design is intended to introduce a hybrid model of the competency-based medical education model to all disciplines of specialty medical education in Canada.

We can conclude that the discipline of General Surgery is in flux because of variety of factors. These changes have

significantly impacted surgical knowledge and surgical care. The overall results of the project have prompted the Royal College and its Specialty Committee in General Surgery to review the training requirements and consider a more “fit for purpose” training scheme, thus ensuring that General Surgery residency training programs would optimally prepare residents for a broad range of practice settings and locations across Canada. The recommendations drafted as part of this project would guide the new training scheme as the Royal College moves forward in addressing the current state of General Surgery training and circumventing future concerns within the discipline.

ACKNOWLEDGMENTS

The authors would like to acknowledge the tremendous work of the Task Force on the Future of General Surgery in their accomplishment of this project. Additionally, the authors would like to thank Dr. Sami Chadi for his review of an initial draft of this article.

Finally, the authors wish to thank our colleagues for the advice and expertise they provided during presentations of the preliminary results of this survey and other components of the overall research project at several national and international medical education conferences:

- (1) Royal Australasian College of Surgeons’ 2014 congress,
- (2) International Conference on Residency Education, 2014 and 2015,
- (3) Canadian Conference on Medical Education, 2014 and 2015, and

- (4) International Conference on Surgical Education and Training, 2014 and 2015.

REFERENCES

1. Pellegrini CA, Warshaw AL, Debas HT. Residency training in surgery in the 21st century: a new paradigm. *Surgery*. 2004;136(5):953-965.
2. Warnock GL. Preparing Canadian surgeons to provide care in the 21st century. *Can J Surg*. 2012;55(4):219.
3. Royal College of Physicians and Surgeons of Canada. *Objectives of training in General Surgery*. 2015. Ottawa, Canada. Available at: <http://www.royalcollege.ca/cs/groups/public/documents/document/y2vk/mdaw/~edisp/tztest3rcpsced000902.pdf>.
4. Debas HT, et al. American surgical association blue ribbon committee report on surgical education. *Ann Surg*. 2005;241(1):1-8.
5. Bell R, et al. Operative experience of residents in U.S. General Surgery Programs: a gap between expectation and experience. *Ann. Surg*. 2009;249(5):719-724.
6. Klingensmith ME, Cogbill TH, Samonte K, Jones A, Malangoni MA. Practice administration training needs of recent general surgery graduates. *J Surg Educ*. 2015;158(3):773-776.
7. Klingensmith ME, Cogbill TH, Luchette F, et al. Factors influencing the decision of surgery residency graduates to pursue general surgery practice versus fellowship. *Ann Surg*. 2015;262(3):449-455.